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**LANDSAT-4 THEMATIC MAPPER
MODULATION TRANSFER FUNCTION (MTF) EVALUATION**

Progress Report
December 15, 1983 - March 15, 1984

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Introduction

During this contract period we have completed TM MTF analysis using the San Mateo bridge as a target in the December 31, 1982, TM scene. Results of this analysis are reported here. We are currently repeating the analysis for the August 12, 1983 scene, as well as proceeding with registration of the under-flight imagery from that date to the TM imagery.

MTF RESULTS - 12/31/82 E

In the last progress report (January 16, 1984) we reported the TM MTF analysis procedures and results for bands 3 and 4. Briefly the analysis consists of calculating the two-dimensional power spectrum (PS) of a 128 x 128 image block containing the San Mateo Bridge and surrounding water. The profile of the PS due to the bridge is corrected for the effect of the width of the bridge to yield the system MTF along the azimuth direction^{OR} thogonal to the bridge. A final smoothing of the MTF is obtained by a power series polynomial fit to the raw MTF.

We have performed this analysis on bands 1, 2, 5 and 7 with the resulting MTFs shown in Figs 1 and 3. TM band 6 has not been studied with this target because there is essentially zero contrast between the bridge and the water in that band, due to the 120m IFOV in band 6. For comparison, the TM MTFs for bands 3 and 4 are shown in Fig. 2 from the previous progress report.

The MTFs for bands 3, 4, 5 and 7 are nearly identical and yield the effective IFOVs (EIFOVs) given in Table 1.

Table 1
TM EIFOVs - 12/31/82 scene

<u>band</u>	<u>EIFOV (m)</u>
3	33.6
4	40.8
5	41.9
7	40.0

The very low image contrast in bands 1 and 2 appears to preclude accurate comparisons with the other bands. This low contrast is manifested in the noisier appearance of the raw MTFs and the relatively high MTF level at high spatial frequencies (0.3 -0.6 cycles/pixel). These differences are almost certainly due to insufficient image contrast between the bridge and water in those bands.

CONCLUSIONS

The MTF for TM bands 3, 4, 5 and 7 was reliably estimated with the San Mateo Bridge target in the 12/31/82 scene. These results will be compared with those from the 8/12/83 scene during the next contract quarter. Bands 1, 2 and 6 must be analyzed with a different target possessing greater contrast. This may be possible with the underflight data comparison currently underway. We have begun the registration of this data to the TM image of 8/12/83 for a region around the Stockton sewage pond east of San Francisco. This particular approach has the advantage that the full two-dimensional MTF will be measured instead of the MTF in only one azimuth as reported here.

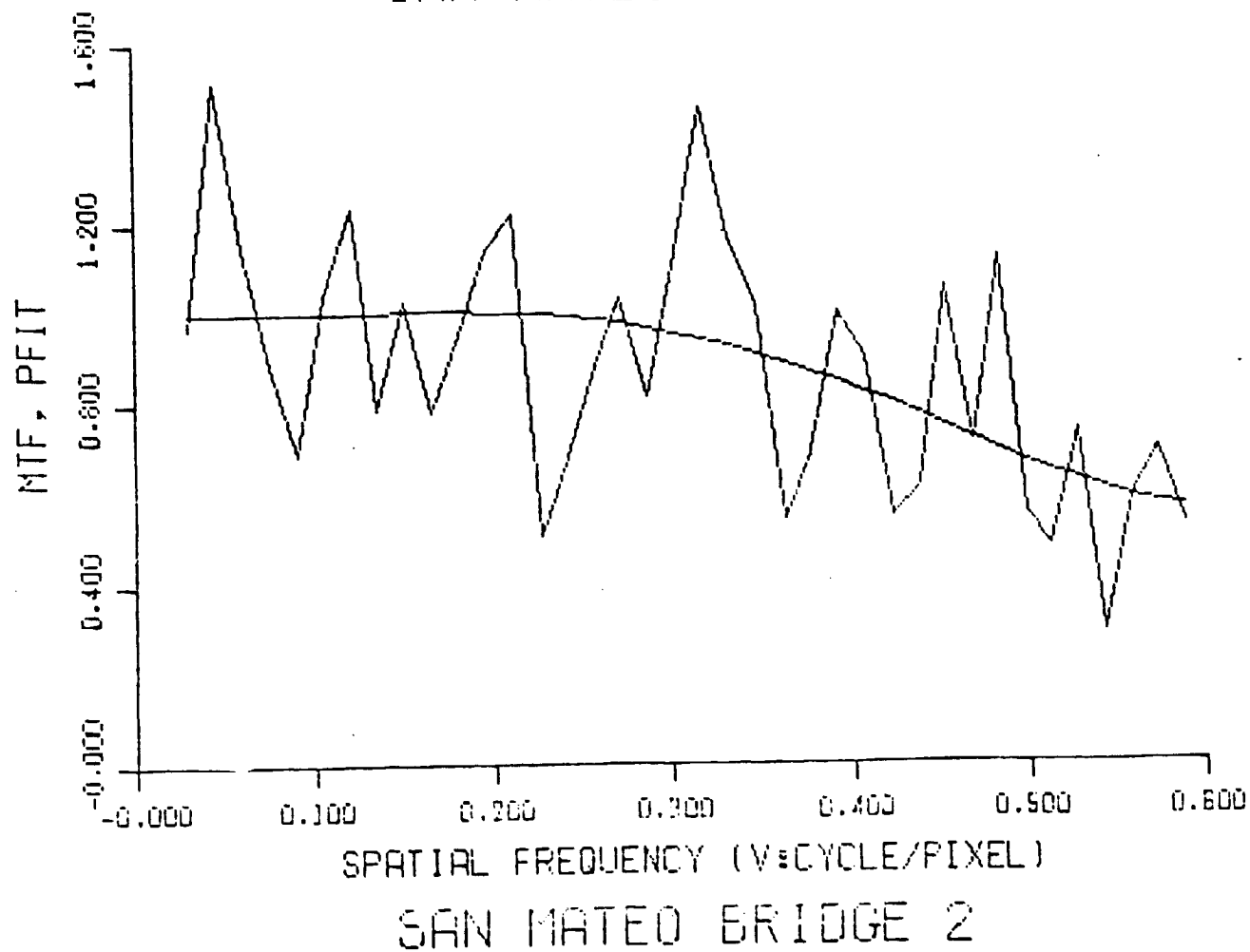
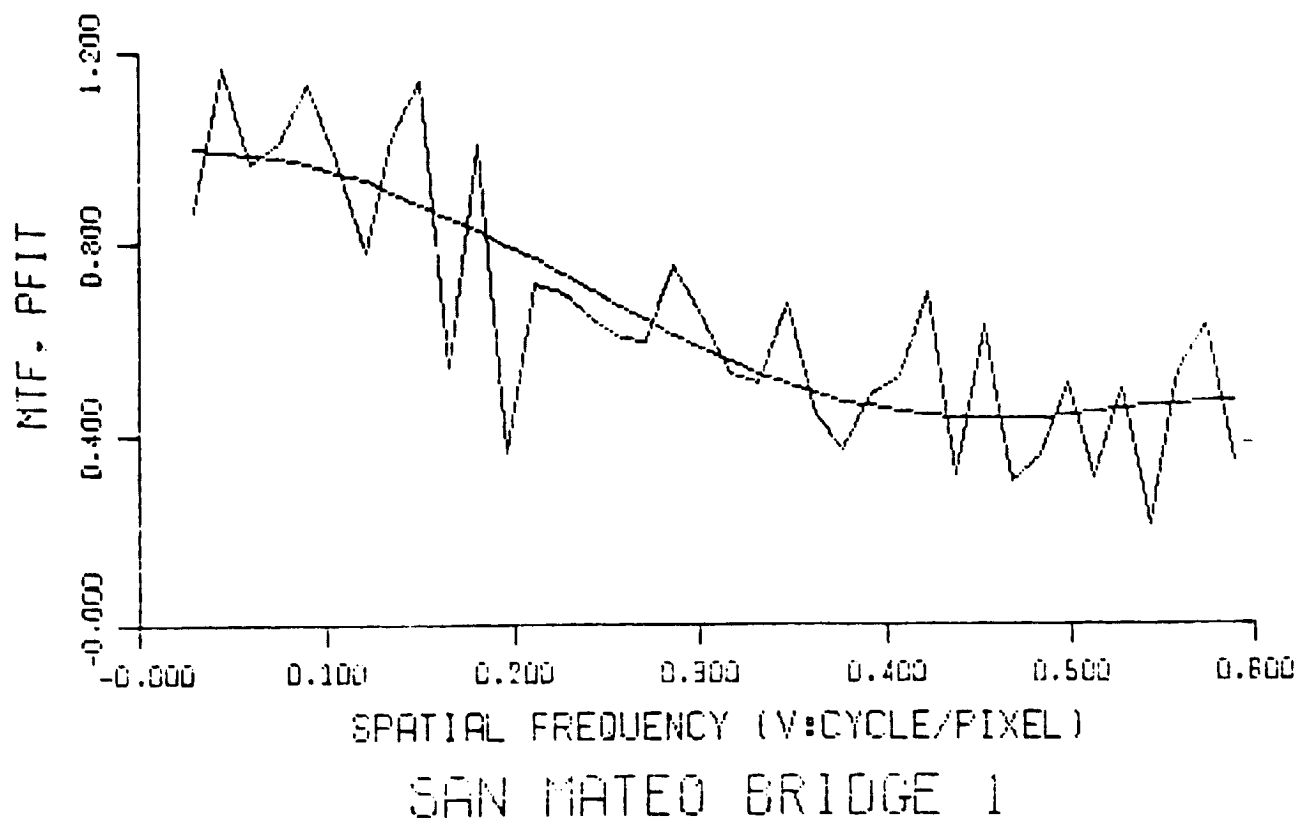
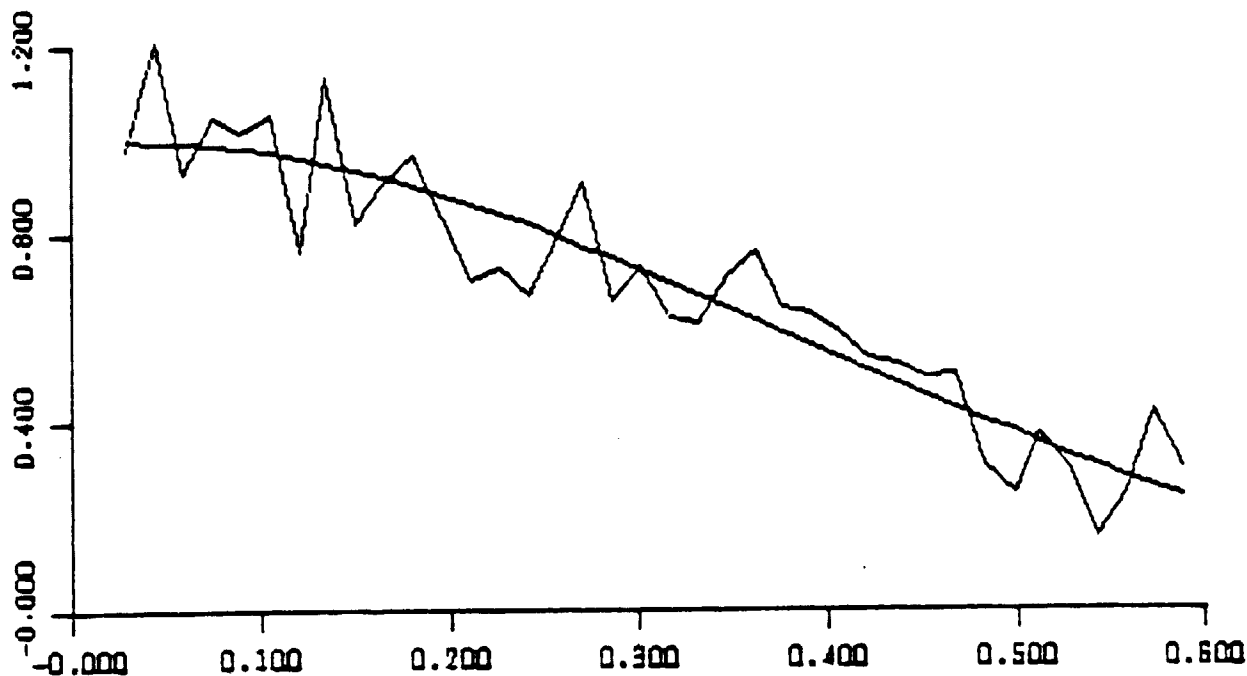


Figure 1. Overall TM system MTFs for bands 1 and 2 - 12/31/82 scene

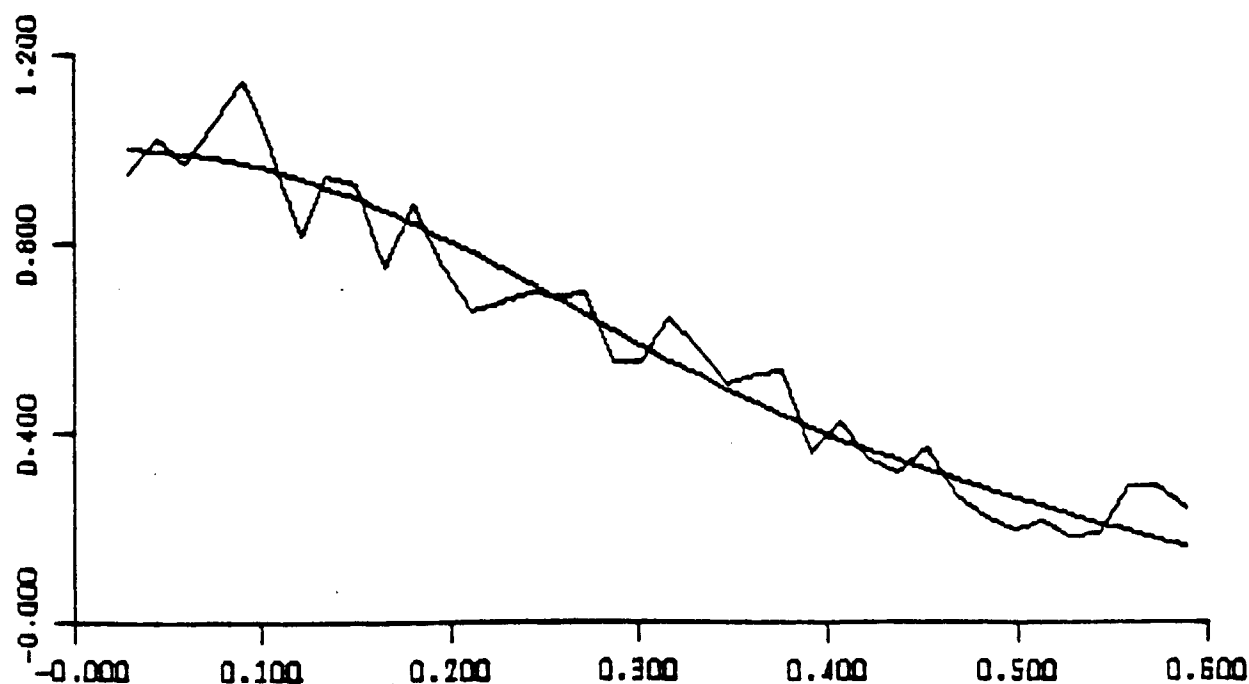
MTF, PFIT



SPATIAL FREQUENCY (V:CYCLE/PIXEL)

SAN MATEO BRIDGE 3

MTF, PFIT



SPATIAL FREQUENCY (V:CYCLE/PIXEL)

SAN MATEO BRIDGE 4

Figure 2. Overall TM system MTFs for bands 3 and 4 - 12/31/82 scene

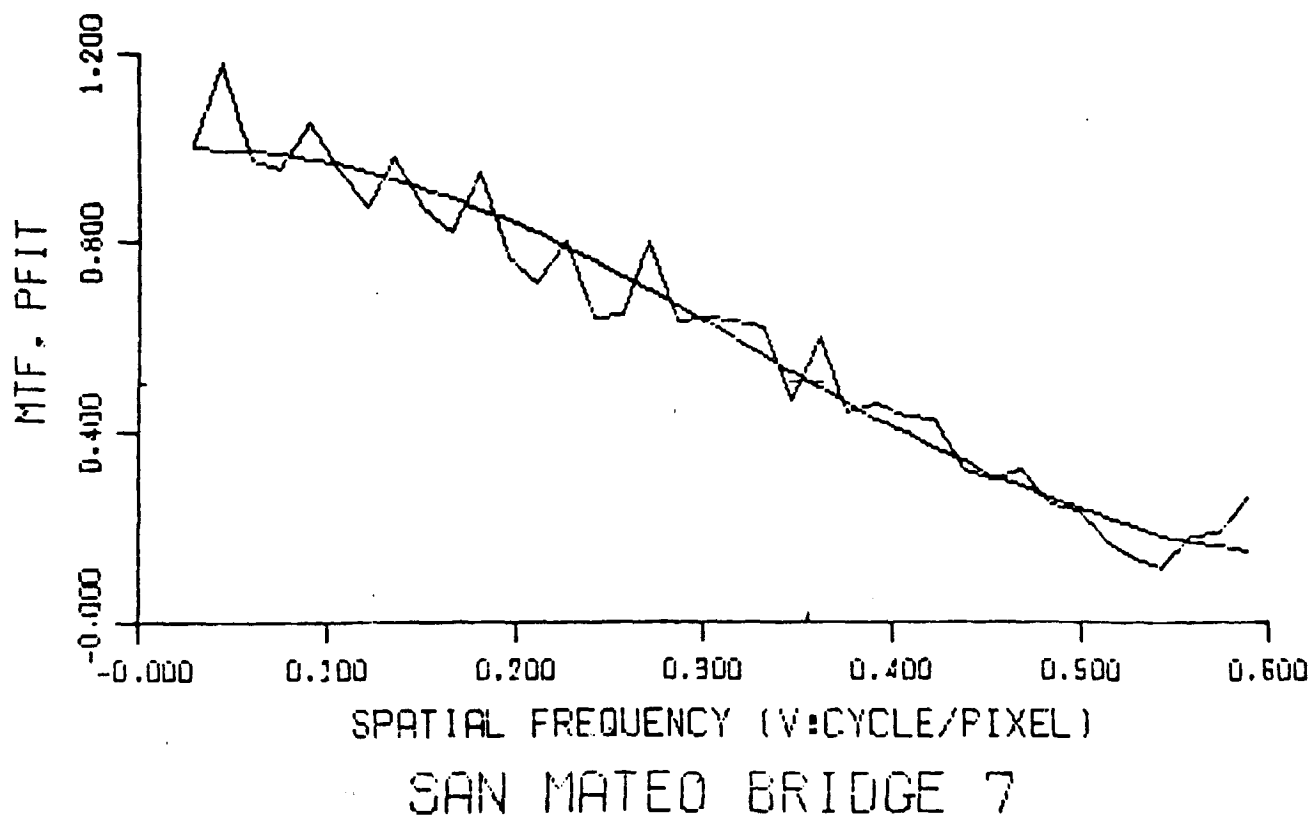
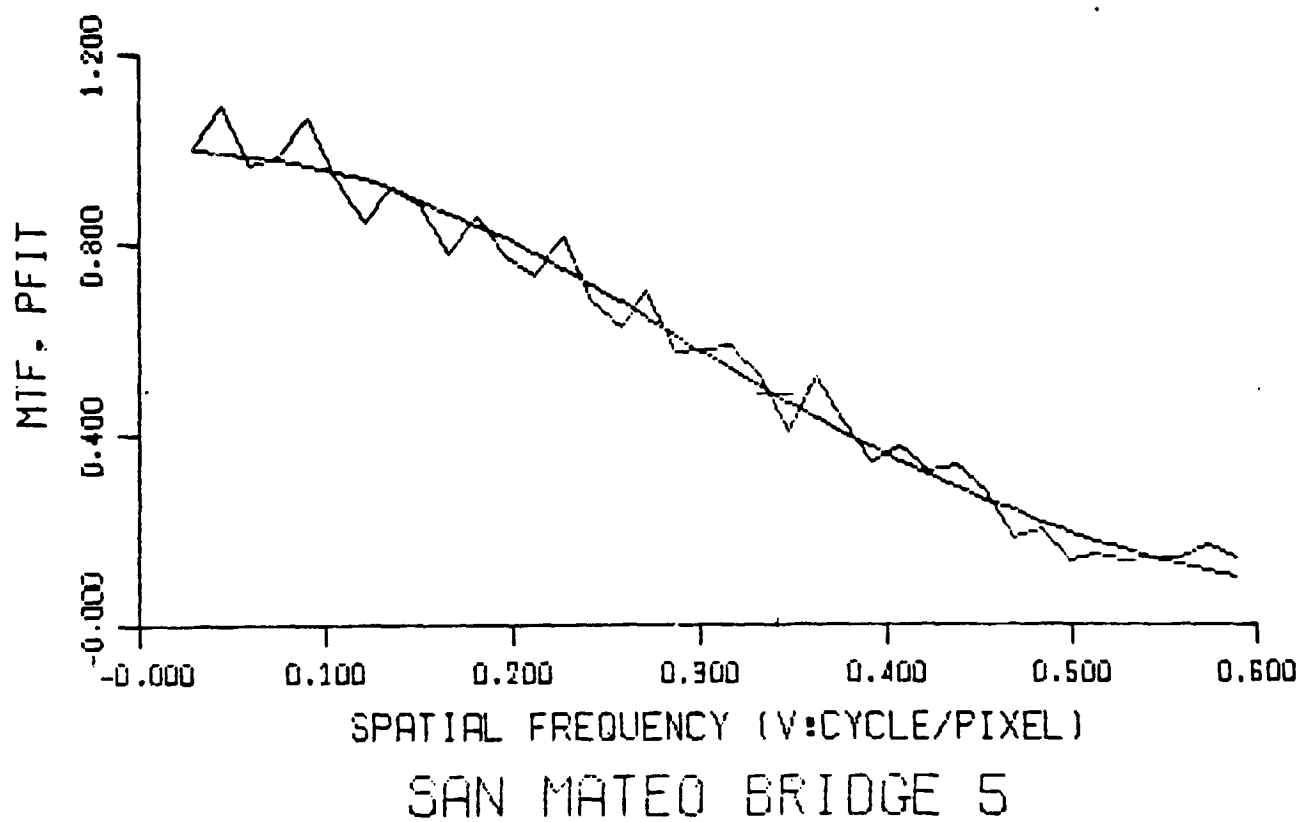


Figure 3. Overall TM system MTFs for bands 5 and 7 - 12/31/82 scene